

**The role of socio-scientific inquiry in biology teaching at secondary level**Author/s Farhana Akmal<sup>1</sup>, Muhammad Sher Baz Ali<sup>2</sup>, Munawwar Ahmad<sup>3</sup>,

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**ABSTRACT**

*Preceding research has acknowledged that the multifarious competences and skills which are characteristically connected to scientific literacy who appoint with socio-scientific inquiry can be obtained by some students. But arising pasture, the use of socio-scientific investigation and research on science teachers for the take up of socio-scientific inquiry, understanding has recognized to a variety of provocations obstacles. We explored in this study, the explanation and accomplishment of socio-scientific inquiry amongst natural science teachers who educate in that prospectus that, in article, is spread through with socio-scientific inquiry. First, as a way to conclusion of coaching truthful natural contented, the teachers usually use socio-scientific inquiry. Secondly in their appraisal practices, on mastery of truthful contented, teachers had an unambiguous importance. Third, to specific biological contents (DNA) the teachers would generally reduce socio-scientific inquiry such that it doesn't seem to permit student to connect through actual socio-scientific inquiry. Our main accentuate are mainly important for strategy producers, educational modules planners and science educators as we dispute that in order to navigate a alienated curriculum, contented-center's main part is understanding might be an adapting approach utilized.*

Key Words: Socio-scientific, science content, ethics, DNA

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## INTRODUCTION

In logical request, researchers think about the characteristic world and propose clarifications dependent on the proof got from their work divers on the grounds that this alludes to a huge field. Request additionally alludes to the exercises of students in which they comprehend logical thoughts and create information and just as a comprehension of how researchers ponder the characteristic world. SSI gives chances to students to consider request of researchers just as draws in students in request forms. SSI as "socio-logical request" in which students utilize logical procedures to consider issues that require arranging political, monetary concerns, moral and logical (Anderson, 2002).

Eventually "request instructing" fills in while the standard intended for heavily disappointment by present in addition to propelling pictures so as to comparable with imagined along with upheld rehearses in pre-college science educating. Ebb and flow science training change archives in U.S (i.e. American Association for the Advancement of Science (AAAS), 1990; National Research Council (NRC) 1996) showed summed up originations of request instructing as well as discovering so as to professed near consider ebb and flow grant science and in instruction. An inclination topic in these originations is progressing and recognizing request as methods and closures.

"Request as finishes" alludes in the direction of request as an seek able result, students figure out how headed for request with regards to discipline content and create epistemological under regarding SSI in addition to advancement of logical learning, just like applicable request abilities (e.g., planning and directing examinations, models and clarifications, distinguishing issues, producing research questions, and safeguarding theories, detailing, imparting. Various researchers have reported that instructing socio-logical request can efficiently affect student inspiration and premium, in school both of them have to find out science contented and to look for after science professions (Dori, Tal, and Tsaushu, 2003; Harris and Ratcliffe, 2005; Parchmann et al., 2006; Sadler, 2009). Different investigations demonstrate that educating socio-logical request adds to student learning results: Such instructing can cultivate basic reasoning abilities, choice making, intelligent decision, and good advancement (Sadler, 2004, 2009; Zohar and Nemet, 2002; Dawson, 2011; Eastwood et al., 2011; Zeidler et al., 2011). Moreover, instructing socio-scientific problems might be added near building up students' logical education (Zeidler et al., 2005). Unmistakably,

educators assume fundamental job in how socio-logical request be instructed(Forbes and Davis, 2008; Lee, Abd-El-Khalick, and Choi, 2006). Pro instance, "The connection stuck between the universe of discipline and civilizations they contain necessary job in teaching students to work like residents (Lazarowitz and Bloch 2005).

In this paper we write about an examination of science educators' elucidations of, or convictions about, (I) socio-logical request and (ii) the job and capacity of socio-logical training exercises for optional school science instructing. All through the document would utilize the expression "socio-logical request" as mean request, problems, inquiries and difficulties. Such issues are regularly characterized for request that from one perspective have a reasonable premise in science, and then again emerge as problems inside moral, biased and conservative domain of civilization (Sadler and Zeidler, 2003). Interestingly, we will utilize the somewhat clumsy phrase "sociocentric instructing exercises" to indicate the showing circumstances or exercises in which at least one explicit sociocentric issues are them, for example a movement in which students are locked in with the issue about regardless of whether to boycott hereditarily changed sustenance's.

Socio-logical issues (SSI) have been proposed to engage students to think about the impacts furthermore, significance of hereditary qualities in their general surroundings (Lederman et al., 2014; Lewis and Leach, 2006; Zeidler *et al.*,2002). It is contended that SSI shape a pivotal piece of logical education (Zeidler *et al.*, 2005) and that SSI would expand the students' enthusiasm for contemplating and inspiration to ponder hereditary qualities (Khishfe, 2014). All things considered, educators have been impervious to receiving SSI in their instructing (Lee, Abd-El-Khalick, and Choi, 2006). This issue is by all accounts unavoidable not only in science instruction, yet in addition in different subjects, including normal and sociologies (Cross and Price, 1996; Lee and Witz, 2009; Misco and Tseng, 2017). A few reasons have been proposed to clarify this marvel, including impediments of the educational programs or appraisal procedures, educator academic capability and that instructors' absence of help for the merits of SSI talks as relevant to explicit learning subjects (Bryce and Gray, 2004; Gray and Bryce, 2006; Lewis and Leach, 2006; Newton *et al.*,1999).While instructors' frames of mind towards various encouraging strategies identified with SSI have been generally examined, there is far less research on how educators contend how they pick their real substance or precedents that they use in instructing practice. With regards to

SSI, an ongoing report recommended that science educators offer power to organic substance over societal contextualization. (Tidemand and Nielsen, 2017).

## **LITERATURE REVIEW**

Pedro Reis (2009) revealed that several educators in science due to its potential have required the consideration of dubious socio-logical inquiry, talk in science educational module for making an all the more genuine compassionate picture of logical movement and intended for advancing logical proficiency, identified with socio-scientific inquiry a basic instrument for a dependable citizenship in regards to basic leadership forms. In view of a contextual investigation focused on a Biology and Geology instructor, this subjective examination meant to comprehend the elements that impact decidedly the conduction of exchange exercises with respect to questionable socio-logical issues. It tried to comprehend the variables by breaking down information from meetings and class perceptions that propel the instructor to actualize this sort of movement. This contextual analysis demonstrates that the usage of the talk exercises about questionable socio-logical request depends conclusively the information required for their plan, the board and evaluation and on the instructor's feelings about the instructive pertinence of these exercises.

Hwang (2018) assesses the laboratory skills and impact of supportive learning methods on students' academic success in biology subject. Quasi-experimental control group interrupted time series design was engaged. Data were composed from 18 biology teachers and 369 students in three schools to pertaining to these variables. To collect data chain semi-structured survey and biological tests were used. To analyze the test scores uncovered by teaching methods Multivariate analysis (two-way ANOVA) was used and semi-structured survey was administered to understand factors that hinder the succeeding implementation of CL.

Siribunnam et al. (2014) stated that by socio-scientific decision-making which is an significant action that improves a student's theoretical perceptive, scientific literacy, social values, attitudes and scientific investigation, the learning ability of students in science is enhanced. This paper expands ahead how to improve socio-scientific verdict in the classroom, presenting a detailed thematic review of socio-scientific decision which is applicable to research studies' requirements, implications, general knowledge claims and methods. The methods of studies consist of class

surveillance, interviewing, open-ended questions, audiotape recorded conversation, role play and free writing. The consequence is that in teaching processes enchanting into explanation of their conclusion, it can be suggested.

Kwok-chi LAU (2013) revealed that if scientific literacy (SL) of Hong Kong students can be enhanced supplementary all the way through a high school biology course employing the STSE approaches, PISA presentation of Hong Kong has encouraged this study to explore. In accordance to the contexts of Hong Kong, a STSE course was developed and for the evaluation of scientific literacy, a structure was organized. For a quasi-experimental study, two classes of high school biology were chosen: one educated conventionally and the other educated with the STSE classes. The consequences demonstrate that in light of its dominance in theoretical perceptive over conventional teaching, a STSE advancement of this study is reasonable in a clearly exam-driven context of Hong Kong. But its effects on attitudes and NOS appreciative are set uncompletion Hong Kong, the consequences have implications for science syllabus reforms.

Eastwood and Sadler, (2012) conducted the inspection on those students which are participating in a conventional biology major (BIO) and also those which are participating in SSI-focused undergraduate human biology major (SSI) and in an interdisciplinary and recognized and distinctive conception of scientific inquiry of them. By investigate their perceptive of scientific examination forty-five SSI students and fifty BIO students completed an open-ended opinion poll. From feedback form responses, eight broad-spectrum themes counting just about 60 subthemes appeared and as well as every subtheme in their responses, the numbers of students were statistically compared stuck between groups.

Abdallah Salim Zobi (2014) conducted the study with the intended that by using Socio-Scientific Inquiry (SSI) advance during teaching practice, the disposition of students' choices designs to natural question as well as chance to enhance these choices would be distinguished. Also, to achieve this, as per Socio-Scientific Inquiry approach, the analyst sorted out and created instruments of the investigation spoken to by a trial of open inquiries focusing on socio-logical issues in ecological subjects and a school component concerning natural problems.

Tuomas Aivelo (2018) revealed that socio-scientific inquiry (SSI) are emphasized and hindrances to considering SSI are extensively considered, science teachers have stumpy attention in adopting SSI in teaching. There is very minute information about the fact that how teachers choose content for their teaching, while in this procedure curricula translates to teaching performance. By interviewing ten Finnish upper-secondary school teachers, we studied how teachers choose content for biology courses on biotechnology, cells and heredity. To build a tentative model of variables which influencing teachers' choices, we used content analysis. We found three main categories of the most important contents: development of gene function, phenotype and inheritance and continuity. While teachers were never mentioned among the important contexts that SSI is important. Teachers differed in how they described teaching: some due to content or pedagogy-related issues described avoidance and others embraced human-related content.

Developing and implementing Socio-Scientific Issues (SSI)-based learning, outlining the process, and assessing students' scientific literacy were the goals of a lesson study conducted in biology classrooms (Rahman et al., 2024). The study, which was carried out in three public high schools, evaluated the procedure and student activities using observation sheets and the Plan-Do-See stages. The findings showed that SSI-based instruction promoted students' active engagement and sharing of opinions. Students at SMA 1 Sanden organized pro- and con-groups to argue the advantages of eating foods based on wheat, resulting in animated discussions and a range of viewpoints that demonstrated their growing scientific literacy throughout the case study on tubers versus wheat. Students at SMA 2 Wates examined cupping therapy from a variety of professional and societal perspectives, and their research revealed an agreement regarding the practice's health advantages. These exercises showed how open classroom practices encourage student participation and consensus-building while assisting in the identification of learning obstacles. The results indicate that lesson studies might be useful for identifying effective teaching strategies and that SSI-based learning can improve scientific literacy (Rahman et al., 2024).

Prior studies have shown that pupils often lack the metacognitive skills necessary to successfully traverse the problems of the twenty-first century. The effect of socio-scientific issues-based learning (SSIBL) on the metacognitive skills of eleventh-grade students was investigated in a study by Irwanto et al. (2024). Quantitative data were gathered from a sample of 72 students (28 males and 44 females) enrolled in a public chemistry program in Jakarta, Indonesia. By flipping a coin,

two classes were designated as the experimental and control groups in this quasi-experimental design. The Metacognitive Activities Inventory (MCA-I) was used to measure metacognitive skills, and independent and paired sample t-tests were used to analyze the data. Prior studies have shown that pupils often lack the metacognitive skills necessary to successfully traverse the problems of the twenty-first century. The effect of socio-scientific issues-based learning (SSIBL) on the metacognitive skills of eleventh-grade students was investigated in a study by Irwanto et al. (2024). Quantitative data were gathered from a sample of 72 students (28 males and 44 females) enrolled in a public chemistry program in Jakarta, Indonesia. By flipping a coin, two classes were designated as the experimental and control groups in this quasi-experimental design. The Metacognitive Activities Inventory (MCA-I) was used to measure metacognitive skills, and independent and paired sample t-tests were used to analyze the data.

## **THEORETICAL FRAMEWORK**

Prior research proposes that instructor convictions manual for a significant degree what amount stress diverse substance and how much educators esteem distinctive parts of learning. Educators individual learning is framed through formal tutoring including instructor training and regular encounters and it isn't static and it likewise keeps on being shaped in proceeding with expert training. Subsequently, conduct convictions about substance and the most appropriate techniques to encourage content are not changed if basic curricular change can cause next to no adjustment in instructors. The accessible showing materials, particularly course readings are the fundamental instruments for substance determination. There is a contention between utilizing fundamentally and following the course reading's substance among teachers as educators appear to comprehend basic perusing of writings as separating themselves from the content. Instructors refer to consistently comprehension of the substance as an imperative angle: to manage course content, the more they seem to believe in their own abilities and to adjust it to classroom setting, the more they can withdraw from the showing materials and settle on increasingly unpredictable decisions in actualizing educational modules.

It has been contended that socio-logical issues lie at the exact center of hereditary qualities training; in this manner, in hereditary qualities instruction, to examining and talking about how societal issues can be handled in hereditary qualities training, a considerable measure of research has been

committed. The focal issues incorporate, however are not restricted to, hereditarily cloning, changed life forms, immature microorganism look into, quality altering, chance appraisals through hereditary testing and hereditary issue testing. These issues have likewise been incorporated into numerous national or nearby educational module yet as a rule, comparative issues appear to prevent instructing socio-logical issues in hereditary qualities as in different sciences. Lately, Genetics instruction has been underscored, as the advancement in both essential exploration of hereditary qualities and the mechanical applications has been fast. The center substance relating to hereditary qualities is for the most part constrained to Biotechnology, which is a discretionary course and two courses cells and heredity, which are compulsory. Moral and lawful issues of hereditarily altered life forms (GMOs) are the main specifically SSI-related points referenced among science center substance. The general piece of the national central subjects refers to cross-curricular topics, including innovation, dynamic citizenship and society, that ought to be "considered in guidance in all subjects as fitting for every specific subject." Thus, instructors have significant opportunity to pick both showing techniques and substance. We were keen on that mystery that in at auxiliary hereditary qualities course, how instructors portray their showing practices and course content. As the Finnish school structure accommodates abundant opportunity for instructors to receive the most reasonable showing techniques and extensively in various fields of science, science educators are commonly taught this takes into consideration investigating the connections between hereditary qualities substance, SSI, and educator view of hereditary qualities as a logical field.

## **RESULTS AND ANALYSIS**

An essential topic that raise up out of the educators' discussion in-connection amid the meetings and from the survey reactions relates to hints of a specific method for parsing SSI. The instructors can be said to engage in a substance focused understanding of socio-logical request as we will outline beneath. These educators offered supremacy to a particular organic substance over a particular societal contextualization at the end of the day – both as far as what comprises a particular issue as a socio-logical issue and as far as why and how a particular socio-logical issue ought to be instructed. All in all, all talked with educators concurred that SSI is portrayed by being issues that are significant to or emerge in the societal circle. For instance, various educators referenced "contamination" as the paradigmatic SSI: As one instructor contended, contamination



is an SSI in light of the fact that "legislators make requests on industry and agribusiness and another educator contended that contamination contains monetary angles as "it has an expense in horticulture on the off chance that they are not permitted to treat utilizing nitrogen. Different models that the educators gave included "microorganisms" – which was alluded to as a SSI "in light of the fact that they are utilized mechanically and in sustenance creation organic chemistry and nourishment" was depicted as a SSI in light of the fact that it identifies with the students' dietary patterns and generally way of life "evolved ways of life" was likewise utilized for instance since it is a societal issue on the off chance that we destroy the last advance of the natural way of life, a few instructors referenced DNA on the grounds that "everything identified with DNA is societal while different educators discussed "hereditary qualities" as a SSI in light of the fact that it identifies with conservative and moral talks in the public eye.

The imperative point here is that the talked with instructors did not by any means define instances of SSI that call upon reflection or posture predicaments for students to settle on choices about, rather, they recorded a scope of center natural substance and contended that these were SSI in light of the fact that they contain probable demeanor on communal and moral consultation. Such as some on from teachers who referenced "pollution" like SSI later in the discussion in-cooperation clarified the point that they utilized pollution like an approach toward outline their substance explicit educating as in she would normally request that her students "explore a lake so as to perceive to see if it was dirtied then which object lived in water. This overwhelming spotlight on logical substance was likewise apparent in the survey reactions and reverberates with what we call the substance focused translation of SSI that developed in the meetings.

The second subject that rose up out of the educator's discussion in-cooperation concerns difficulties for socio-logical showing exercises in science. The instructors were gotten some information about the suitability of socio-logical showing exercises in the meetings – for example encouraging that includes an unequivocal commitment with an SSI (rather than showing exercises in which the societal and moral contextualization was inaccessible or completely missing in the educating). These difficulties fell into three separate classes. Right off the bat, challenges are distinguished at the framework level by all educators. All educators concurred that time requirements are obstructions to undeniable socio-logical instructing exercises. As indicated by the educators, a great part of the time accessible is spent on authoritative errand and on trials of

various types, in research facilities. Most educators referenced that a great deal of subject explicit natural substance was secured by educational programs requests, and that undeniable socio-logical instructing would be to the detriment of planning students for tests.

Second, all instructors distinguished difficulties at the dimension of the educator. By and large it appears that the educator's impression of the branch of knowledge and his/her advantages and convictions when all is said in done effect if and how that instructor actualizes socio-logical instructing exercises. A few instructors were principally intrigued by natural substance for example one instructor expressed that even ascommunal parts of substance identified with "endocrine disrupters" be"fabulous", with statement that "this significantly increasingly enjoyable to investigate what hormones do to us. Others essentially liked to concentrate on organic substance instead of on communalissue: I would be fastening on that which I be familiar without a doubt, likewise in regards to the subject explicit substanceetc. I mean, I like to show them certainties and after that they should settle on choices when they feel the requirement for it and they are in a superior position to do that on the off chance that they know how things. One educator even discovered undeniable socio-logical instructing "exhausting" and subsequently did not feel "submitted" to it. Further, the educators by and large felt that their need in foundation in the sociologies renders them less fit the bill to instruct SSI, and a few instructors contended that SSI ought to have their common home in different trains, for example, social examinations or interdisciplinary exercises, instead of in science educating.

Third, all instructors recognized difficulties at the dimension of the students. As indicated by some of the educators, numerous students are not ready to participate in socio-logical discourses as well as argumentation. As indicated by these educators, the lion's share of studentsdoesn't have enough natural substance information to legitimately take part in talks or potentially (organic) argumentation about SSI, as one instructor for instance contended that they "need to guarantee that the students are great at natural substance learning before they can sit and examine on a socio-logical dimension utilizing contentions from science.

The third topic that rose up out of the educator's discussion in-connections identified with developmental and summative evaluation with regards to undeniable socio-logical instructing. Remarkably, the vast majority of the educators expressed that they see their job as various in undeniable socio-logical instructing contrasted with "ordinary educating" and indicated to classroom condition additionally extraordinary rather customarily, because of for example "try not to have a similar judge job as soon as contain a socio-logical discussion, and as the students "are permitted to think of sentiments and talk about. It appears that the vast majority of the educators' contemplations on appraisal of the capabilities identified with socio-logical instructing exercises are centered around the tests. The educators clarified that they don't concentrate on developmental evaluation or that their emphasis is for the most part on students' capacities to utilize organic substance information in their argumentation because of the way that that is the thing that the students get kudos for at the tests. Aside from that, the educator's discussion on evaluation was very different and uncertain, which could show that the instructors are uncertain of how to deal with the appraisal, or that there is no accord on the best way to survey the more nonexclusive capabilities that are affecting everything in socio-logical educating. This was viewed as they talked about that the signs that students accomplish a portion of the skills could for instance be the point at which the students settle on decisions because of their insight move is identified with making be concerned anyone's own wellbeing, intended for instance with the learning you had. Different educators expressly expressed that they don't survey these skills, either on the grounds that they see that the appraisal is hidden what they regularly instruct in class, or on the grounds that they think that its testing to deal with the evaluation. For instance, a few instructors contended that it is trying to deal with students' sentiments by and by. The educator's stories demonstrate that students when all is said in done have a ton of feelings that are trying for instructors to deal with eventually, and that these are for them most part displayed without proof or (natural) argumentation, however dependent on close to home feelings or encounters. The larger part of educators expressed that students' feelings are of no utilization, since student sentiments dependent on feelings and individual encounters can't be surveyed. Most instructors contended that student execution in socio-logical encouraging exercises plays a job in the general evaluation of the student. Nonetheless, none of the educators could exhibit an unmistakable technique regarding how to survey the abilities that could be the learning destinations of socio-logical instructing exercises. A few educators contended that one can't survey such skills independently, however the assessment

is a wide-ranging evaluation contain evaluates the entire depiction as instructors for instance evaluate student's capacities to pick, structure, present, and take part in a discourse. A few educators clarified that it is hard to do the appraisal at the oral tests and in this manner they center around students information with respect to natural substance rather, as one instructor for instance disclosed It is less demanding to check whether they do it, I mean, at that point you can see "she referenced that and that and that so in that way it is simpler to outline what they get, while the degree to which they associate it to the individual and socio-logical turns into somewhat wooly, so that turns out to be increasingly hard to gauge and survey, here and there, in light of the fact that it isn't totally unambiguous.

## **DISCUSSION**

One of the focal discoveries from the meetings that could be approved by the aftereffects of the poll ponder is that the taking an interest educator engaged what we have called a substance focused understanding of SSI for example when discussing SSI, the educators offered supremacy to a particular natural substance over a particular societal contextualization. This substance focused understanding had three fundamental indications, which we will talk about in the accompanying.

In the first place, it showed as an instrumental utilization of socio-logical educating exercises. Obviously, for both the talked with instructors along with educator respondents in survey, the explanations behind incorporating communal contextualization regarding educating was fundamentally liketooltoward persuade edge. The instrumental method for operational sing SSI has been great archived in science instruction inquire about for example by (Barrett and Nieswandt 2010) who found that a few educators "reason for including morals is to get understudies intrigued sufficiently long to show them certainties in addition to speculations of discipline otherwise motivate them toward like science for the wellbeing of its own."

Secondly the substance focused translation showed as a substance inclination in evaluation practice. The talked with instructors obviously put significantly more load on understudies' capacities to utilize natural substance information than on the understudies capacity to explore unravel and settle on choices on SSI appropriate. In reality, this gathering of educators couldn't distinguish compelling criteria for evaluating the aptitudes and capabilities that are impacting

everything in undeniable socio-logical instructing. Be that as it may, it is misty whether this is because of their absence of for example learning of or eagerness to organize, esteem loaded talks. There is in particular a general inclination that is essentially trying in favor of Danish science instructors to distinguish in addition to position to utilize evaluation criterion capabilities when contrasted with information and comprehension (Nielsen and Dolin, 2016).

Third, the substance focused understanding showed as a reductive story of implementing socio-logical instructing exercises. Review that the instructors in the meetings at first held that they incorporate socio-logical issues in their educating. Be that as it may, over and over the instructors' discussion in-association contained the accompanying encapsulated thinking (A) all organic substance is conceivably identified with society, subsequently (B) encouraging natural substance is socio-logical educating. As far as anyone is concerned, as opposed to the instrumental operationalization of SSI this reductive account appears to expand existing examination. This investigation does not empower us to make a correct distinguishing proof with respect to what has prompted this substance focused understanding of SSI among the taking an interest educator. In any case, there seems to be a few signs though not consistently in the instructors' discussion in-cooperation. Day and Bryce (2011) revealed the fact that science educators examined swung to instructor focused exercises to facilitate absolutely truthful parts of science as a type of adapting methodology in light of the different academic difficulties that assails giving understudies a chance to draw in with open-finished SSI. What we have called the reductive story (the thought that all organic substance is in the end contextualized in the public arena, along these lines all instructing of natural substance is socio-logical educating), might just be a comparative type of account technique for this gathering of educators to adapt to the unequivocal yet conceivable ostensible socio-logical parts of the educational modules. This interfaces with the difficulties at the framework level distinguished by the instructors in this investigation. Review that all instructors communicated that they don't have the proper time assets for executing undeniable socio-logical instructing; and that most educators see the educational programs to just ostensibly be centered around SSI as in the end of the year tests do put a broad spotlight on organic substance. Our accomplished can be identified with and expand on the discoveries of (Levinson and Turner 2001) in the two conditions, analysts set up the fact that educators from two different countries one is Korea and the other is England commonly optimistic to instructing SSI, Plainly, some of the

educators we met seemed to concentrate on showing organic substance on the grounds that the examinations appear to concentrate on dominance of natural substance instead of capabilities identified with SSI. Be that as it may, for some of the talked with educators, the substance center appeared to be driven by a solid individual association with organic substance what we (in absence of progressively exact terms) may call their way of life as science instructors). There is a fascinating association between what we have called the reductive story (for example the decrease without eminent rest of socio-logical instructing exercises to exercises that spin around organic substance) to the inclination of science training analysts to diminish the investigation or evaluation of socio-logical factious talk to a matter of the nearness and nature of science verifiable substance.

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